Ohio Agricultural Research and Development Center

SEEDS

Number 35 | RESEARCH UPDATE

Optimizing Ozone Processing Technology for Farm-Fresh, *Salmonella*-Free Shell Eggs

Dr. Ahmed Yousef, Dr. Ken Lee

The U.S. Egg Safety Action Plan calls for complete eradication of *Salmonella* from market shell eggs by 2010. Food safety and security are very high national priorities with major local impact. Ohio ranks fifth in the nation for food processing and manufacturing, and second in egg production. Therefore, the national action plan has a major impact on Ohio egg producers and processors, and also on the State's economy.

Salmonellosis is a foodborne illness caused by ingesting *Salmonella*, a bacterium found in eggs and other foods. Annually, there are 1.4 million cases of salmonellosis in the United States; 600 of those cases result in death. Salmonellosis costs the United States $2.3 billion every year, an estimated $96 million for Ohio alone. This research seeks to make Ohio the national leader in egg safety by developing industrial processes that will eradicate *Salmonella* from commercial eggs.

There are currently two imperfect methods to inactivate *Salmonella* in shell eggs—gamma irradiation and in-shell pasteurization. Gamma irradiation uses high-energy gamma rays produced by radioactive sources. The eggs are brought into a heavily shielded chamber and exposed to gamma rays for a defined length of time. While gamma irradiation is effective, it has a negative impact on egg quality. Consumer acceptance becomes an issue once egg quality is compromised. While in-shell pasteurization also eradicates *Salmonella*, it also negatively affects consumer acceptability. In-shell pasteurization is a lengthy treatment where the egg is heated to 54–64°C through a series of warm water baths. The baths heat the eggs enough to kill the bacteria, but not enough to cook them. The eggs are then quickly chilled, inspected for cracks, and coated with a sealant to prevent any sort of re-contamination. This process is commercially available; however, the excessive heating affects egg proteins and decreases the quality and consumer acceptability of the egg.

An interdisciplinary team of Ohio State University scientists found that combinations of ozone, carbon dioxide, mild heat, and alternating vacuum and pressure used in the research study eradicated *Salmonella* while still maintaining the high quality egg product.

OBJECTIVES

To optimize the ozone processing technology for eradication of *Salmonella* in fresh eggs and to explore the market potential of the process.

ACHIEVEMENTS

A team of Ohio State University scientists developed and patented a new method of eliminating *Salmonella* using a combination of ozone, carbon dioxide, mild heat, and alternating vacuum and pressure.

THE FUTURE

Further research is being conducted in collaboration with industry partners. Plans to upgrade from a small pilot plant to an industrial setting are currently being finalized.

Technology migration from an Ohio State University pilot plant to industrial settings is the ultimate proof of project success. With this accomplished, Ohio egg producers could lead the nation in marketing *Salmonella*-free eggs, and fulfill an important national goal. Consumers across the nation will enjoy worry-free eggs from Ohio.

THE OHIO STATE UNIVERSITY EXTENSION OARDC

THE OHIO STATE UNIVERSITY COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

This research is supported in part by state of Ohio funds allocated to the Ohio Agricultural Research and Development Center of The Ohio State University.

October 2005 FS35-05